Danish Academy in Wind Energy, DAWE. Report 2003-2008

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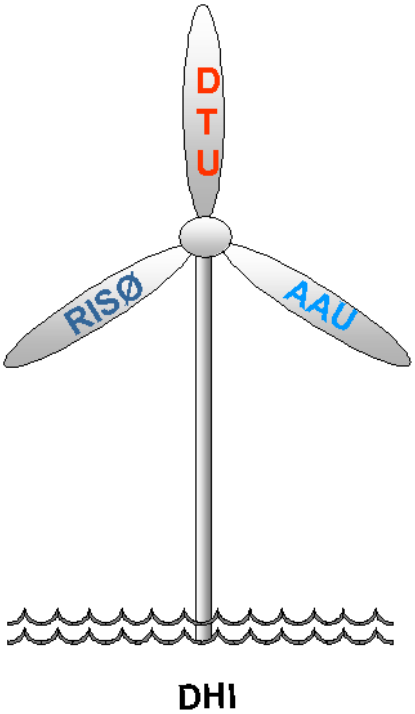
Publication date:
2009

Document Version
Publisher's PDF, also known as Version of record

Danish Academy in Wind Energy

DAWE



Report 2003-2008

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October 2009

Goals of the Danish Academy of Wind Energy (DAWE)

The overall goal of the PhD graduate school is to strengthen the research in Wind Energy in order to maintain and further develop the leading position of Danish Industry in this area. This is accomplished by attracting the best students and internationally recognized guest researchers to participate in research projects within the field of Wind Energy. For the moment about 61 PhD students plus a number of MSc students are involved in the PhD graduate school and the school is a hub in a network among all students in the Wind Energy area in Denmark. 49 PhD students have finalized their PhD degree within the PhD graduate school since 2003. Finally, it also maximizes the synergy and collaboration in research between the partners in the Research Consortium for Wind Energy.

The PhD graduate school is highly interdisciplinary and covers research themes within all aspects of wind energy conversion, including aero-elasticity, aero-dynamics, control, monitoring, meteorology and siting, power electronics, grid connection, power systems, wind turbine composite blades, rotor dynamics, loads and safety, energy planning and socio-economic aspects. The graduate school offers continuously state-of-the-art courses in the field; supports post docs and guest professors, supports co-funded PhD scholarships with industry and arrange summer schools every year. DAWE was established in 2002 and has the web-site **www.dawe.org.**

Organization in DAWE

- The Danish Academy of Wind Energy is a strategic important part of the Danish Research Consortium (DCR) of Wind Energy, which is realized through a collaboration agreement between Risø, Technical University of Denmark, Aalborg University and the Danish Hydraulic Institute (DHI). Fig. 1 shows the organization of DRC.

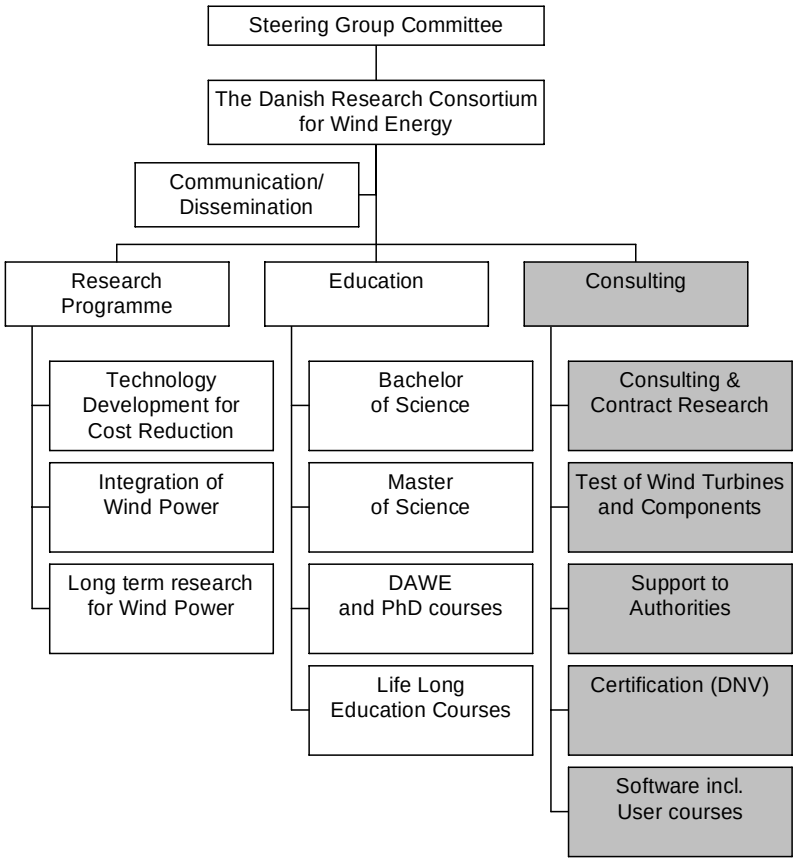

Fig. 1. Structure of the Danish Research Consortium in Wind Energy. The area marked grey has a minor coordination in the consortium.

Each activity has its own leader with representation from all relevant institutions. The research consortium is acting through an annual planning with goals and activity plan. Two times every year the Steering Committee has meetings to follow up on the plans and solve potential problems. The Steering Committee has representatives from the four involved institutions, wind turbines industry, utilities, consulting companies. The activity in DAWE reports back to the Steering Committee. DAWE is an essential part of the education-leg in DRC and it has a board consisting of:

Professor Frede Blaabjerg, Aalborg University, IET (-2007)
→ Professor John Dalsgaard Sørensen, Aalborg University, Civil Engineering (2007-)
Professor Jens Nørkær Sørensen, DTU-MEK
Adj. Professor Søren E. Larsen, VEA-Risø-DTU

Quarterly meetings are held every year. Focus is both on the research education and on the education on Master level in order to strengthen the Wind Turbine education in general.

International activities and relations
The Danish Academy of Wind Energy initiated the idea to establish an European Academy of Wind Energy (EAWE). An agreement was signed 2003. The core group of the European Academy of Wind Energy includes at present 30 entities, representing 7 countries and more than 80 % of the long-term research activity in the field of wind energy. Fig. 2 shows the structure.

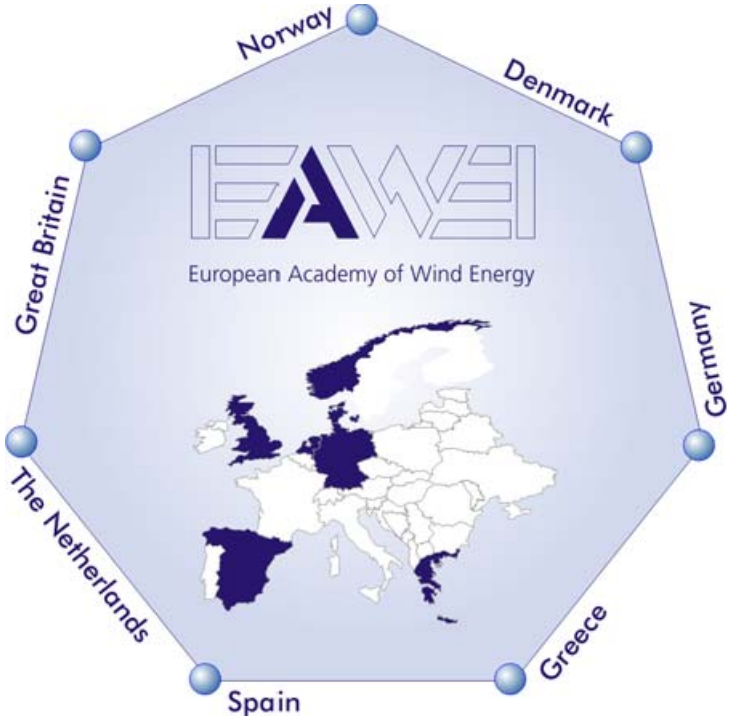

Fig. 2. Overall structure of the European Academy of Wind Energy (EAWE).

During the years, the group members have established strong links through a systematic collaboration under the European Framework Programmes and through common participation in human networks, including European and International Standardization and Certification bodies.

All core partners have an outstanding position in their national Wind Energy research activities. The network will advance knowledge in the area of wind energy, by pooling a

critical mass of competence and skills. The initial core group is structured with national nodes, represented by major wind energy research institutes with associated partners from universities or other research institutes. The national networks are well established through consortia or firm agreements of cooperation.

The core group of the network includes the following entities with an outstanding experience in wind energy research:

- **Denmark:** Risø National Laboratory, Aalborg University, DHI Water & Environment, Technical University of Denmark
- **Germany:** ISET, University of Kassel, University of Hannover, University of Magdeburg, University of Stuttgart, Carl von Ossietzky University of Oldenburg
- **Greece:** National Technical University of Athens, CRES, University of Patras
- **Netherlands:** Delft University of Technology, ECN
- **Norway:** SINTEF, Institute for Energy Technology (IFE), The Norwegian University of Science and Technology
- **Spain:** CENER, Instituto de Investigación de Energías Renovables (IIER), Universidad Carlos III de Madrid (UC3M), Universidad Politécnica de Madrid, Universidad Pública de Navarra
- **United Kingdom:** CCLRC Rutherford Appleton Laboratory, Imperial College London, Manchester Metropolitan University, University of Durham, Loughborough University, University of Manchester, University of Strathclyde, University of Surrey

EAWE arranges each year a PhD seminar with PhD students from the participating research institutions.

In 2006 the EU financed IP research project UPWIND with wind energy started. The 40 participating partners include all major wind turbine manufacturers and research institutions in Europe. The budget is 15 mill. Euro and the duration of the project is 5 years. UPWIND will finance a number of new PhD projects within wind energy.

The activities of the EAWE are split into:

- integration activities, through PhD exchanges, exchange of scientists, exploitation of existing research infrastructures,
- activities to spread excellence, through development of international training courses, dissemination of knowledge, support to SMEs, standardisation,
- long-term research activities (see below).

The following thematic areas (and topics) are identified as first priority long-term RTD issues for EAWE's joint programme of activities:

- Long-term Wind Forecast
- Wind Turbine External Conditions
- Wind Turbine Technology
- System Integration
- Integration into Energy Economy

In the following sections the activities in the period 2002-2008 are briefly described.

Annex A contains lists with finalized and ongoing PhD studies within DAWE.

Activities 2003

In 2003 16 PhD students were enrolled in the research school. Most of the projects are done in close collaboration between the partners in DAWE. Even though a number of projects are carried out with industry, co-funded scholarships (1/3-1/3-1/3) have been difficult to start up with companies. The main reason is the changes in industry in 2003.

Initiated from one of the DAWE PhD projects, a new **Scandinavian FEM/Composite Network** (www.FEM-Komposit.Risoe.dk) is started. The network has participants from the Danish, Swedish and Norwegian industry and Universities, Research Institutions. From the Danish Wind Turbine Industry four blade/turbine manufacturers are part of the network. The mission of the FEM - Composites network is to provide a communication forum for the engineering and scientific community in the field of analyses of composites and to provide the growth of knowledge, by relating this experience to practical applications. The network provides an industrial interface between research division, education section and the industry. The meetings vary in content, and furthermore special courses, lectures and visits to companies are also arranged.

Networking, presentations and courses

- Summer-school – "Wind Turbines and their integration", August 11-15, 2003. Held both at Risø, DTU, Aalborg University. Site visit's at Middelgrunden and the Wind turbine company NEG-Micon. More than 30 participants from 10 countries and industry was also participating. About 15 people were making lectures during the five days. A cross-disciplinary course and a very positive feedback was given through an evaluation.
- DAWE Mini-symposium on Actuator Disc Modelling of Wind Turbines, November 18, 2003 at Risø with more than 30 participants. (see www.dawe.org for programme).
- **Poster-session** at the DANWEA conference in Ebeltoft, November 27-28, 2003 for M.Sc. and Ph.D. students. About 20 presenters participated with posters and in total more than 100 participants at the conference. DAWE sponsored the participation of M.Sc. students.

A web-site has been prepared and it is continuously being updated with projects and activities. See www.dawe.org

A brochure has been prepared and distributed globally in order to attract students and researchers.

Activities 2004

9 Ph.D. students were enrolled in the research school in 2004. Even though a number of projects are carried out with industry, co-funded scholarships (1/3-1/3-1/3) have been difficult to start up with companies – as in 2003. Therefore the last DAWE funding will be used without necessary full 1/3 funding from industry.

Networking, presentations and courses

- PhD-course: ” *Wind Turbine Aerodynamics and Aeroacoustics*” (DTU, Risø), 2004 (5 ECTS). About 20 students participated. 5 from industry, 8 from abroad and 7 from Denmark. A success with major payment from industry.
- PhD-course: “*Electrical Aspects of Wind Turbine Systems”* (AAU), June 1-4, 2004 (4 ECTS). About 20 Ph.D. students participated in the wind turbine course, with participants from Europe, Africa and Asia. A lot of new material is prepared and the course will be held in 2005 again. A majority was from abroad.
- Ph.D. Course ” *Analysis and Design Optimization of Laminated Composite Structures*”, May 18-19, June 9-10, 2004 (AAU).This course was held with 25 students from all over the world. A success.
- Nordic Network in the area Finite Element and Composite http://www.FEM-composite.risoe.dk with 2 Network meetings, 2 FEM-cources with external supervisor.
- Fracture Mechanics Workshop, sponsored by DAWE, Risø and Danish Energy Authority. Risø 31.11.2004 - 01.12.2004.

- **Poster-session** at Dansk Selskab for Vindkraft Conference in Ebeltoft, November, 2004 for M.Sc and Ph.D. students. About 18 presenters participated with posters and in total more than 150 participants at the conference. DAWE sponsored the participation of ten M.Sc. students. It was a very good success.

Activities 2005 & 2006

29 Ph.D. students were enrolled in the research school in 2005 and 2006. 11 PhD students have finalized their PhD degree.

Post docs

Xiaoli Guo Larsén	Extreme winds and loads	Jacob Mann, VEA	2004-2007
Beat Lüthi	Lagrangian turbulence	Jacob Mann, VEA	2004-2007
Igor Naumov	DTU	Jens N. Sørensen	2006

Guest PhD students

Igor Naumov	DTU	Jens N. Sørensen	2005
Wouter Haans	DTU	Jens N. Sørensen	2006
Carlo Carcongiu	DTU	Jens N. Sørensen	2006
Simon-Philipe Breton	DTU	Jens N. Sørensen	2006

Guest Professor

Xiao Jinsung	DTU	Jens N. Sørensen	2005
Robert Parker	Risø	Morten Hartvig Hansen	2005
Amr Henni	DTU	Jens N. Sørensen	2006

N**etworking, presentations and courses**

- PhD Course *"Analysis and Design Optimization of Laminated Composite Structures"*, May 10-11, June 14-15, 2006 (AAU). 5 ECTS. This course was held with 13 students – 7 students were from abroad.
- PhD Course "*Electrical Aspects of Wind Turbine Systems* ", May 2-5, 2006 (AAU). 4 ECTS. This course was held with 14 students – 6 students were from abroad.
- PhD Course "*Experimental Fluid Mechanics and Data Interpretation*", August 2005 (DTU). 5 ECTS. This course was held with 7 students – 2 students were from abroad.
- PhD Course "*Micro Scale Meteorology and Turbulence*". January-February 2006 (Risø). 5 ECTS. This course was held with 10 students.
- PhD Course *"Energy System Analysis of Large-Scale Integration of Wind Power"*. November 14-16, 2005 (AAU). 2.5 ECTS. This course was held with 15 students – 5 students were from abroad.
- PhD seminar within EAWE (European Academy of Wind Energy, see below) in Athens September 2005 with more than 40 PhD students participating.
- PhD seminar within EAWE (European Academy of Wind Energy, see below) at Risø October 2006 with more than 100 PhD students participating.

Poster-session at Dansk Selskab for Vindkraft Conference in Ebeltoft, February, 2006 for Ph.D. students. Presentation of PhD projects from 2005 from AAU, DTU and Risø. About 10 presenters participated with posters and in total more than 150 participants at the conference.

Activities 2007 & 2008

43 Ph.D. students were enrolled in the research school in 2007 and 2008 (and first months of 2009). Compared to the previous years it is seen that the number of PhD students within wind energy continues to increase. 35 PhD students have finalized their PhD degree.

Post docs

Peter Bull	AAU	Ole Thybo Thomsen	2007-2008
Abdul Hamid Sheikh	AAU	Ole Thybo Thomsen	2007-2008
Mohsen Soltani	AAU	Thomas Bak	2008
Yang Hua	DTU	Jens N. Sørensen	2008
Wang Xudong	DTU	Wen Zhong Shen	2008

Guest Professor

Yeoshua Frostig	AAU	Ole Thybo Thomsen	2007
Rongyong Zhao	AAU	Thomas Bak	2007-2008
Su Yongqing	AAU	Thomas Bak	2007-2008
Fazle Hussein	DTU	Jens N. Sørensen	2008

N**etworking, presentations and courses**

- Ph.D. Course ”Advanced Energy System Analysis on the EnergyPlan model”, February and March 2007 (AAU). 4 ECTS. This course was held with 6 students.
- Ph.D. Course ”Analysis and Design Optimization of Laminated Composite Structures”, 2008 (AAU). 5 ECTS. This course was held with 18 students of which 7 were from abroad.
- Ph.D. Course ”Introduction to Wind Power (generation and Integration)”, 2008 (AAU). 3 ECTS. This course was held with 10 students of which 1 were from abroad.
- PhD Summerschool “ Remote Sensing and Wind energy” 2008 (Risø DTU). 3 ECTS. This course was held with 25 students of which 10 was from a abroad.
- PhD Summer school ‘Experimental fluid dynamics and data interpretation’, June 2007 (DTU), 5 ECTS, 25 students
- ‘The Science of making torque from wind’. Conference held at DTU, August 2007. 250 paticipants.

- PhD seminar within EAWE (European Academy of Wind Energy, see below) at CENER, Spain October 2007 with more than 120 PhD students participating.
- PhD seminar within EAWE (European Academy of Wind Energy, see below) in Magdeburg, Germany October 2008 with more than 120 PhD students participating.

- **Presentation of PhD projects** at Dansk Selskab for Vindkraft Conference in Nyborg, April 2007. 9 PhD projects from AAU, DTU and Risø were presented. In total more than 150 participants at the conference.
- **Presentation of PhD projects** at Dansk Selskab for Vindkraft Conference in Nyborg, May 2008. 5 PhD projects from AAU, DTU and Risø were presented. In total more than 200 participants at the conference.

PhD projects partly financed by DAWE:

Philippe Venne	Agent-based control of isolated power system	Henrik Lund, AaU Henrik Bindner, VEA, Risø-DTU	2005-2007
Gabriel G. M. Hernández	3D modeling of laminar-turbulent transition on wind turbine blades	Jens Nørkær Sørensen, DTU Wen Zhong Shen, DTU Martin O.L. Hansen, DTU	2005-
Niels Troldborg	Numerical Simulation of Wakes of Wind Turbines in Wind Farms	Jens Nørkær Sørensen, DTU Robert Mikkelsen, DTU Wen Zhong Shen, DTU	2005-2008
Find Mølholt Jensen	Ultimate Strength of a Large Blade Design	Henrik Stang, DTU Jakob Wedel-Heinen, DNV Kim Branner, Risø-DTU	2003-2009
Menghua Zhao*	Optimization of electrical system for offshore wind farms via a genetic algorithm	Zhe Chen, AAU Frede Blaabjerg, AAU	2004-2006
Nicolai Heilskov	Aeroacoustic Noise Modelling of Noise Emission from Wind Turbines	Jens Nørkær Sørensen, DTU Wen Zhong Shen, DTU Finn Jacobsen, DTU	2003-2006 Stops in 2006
Wei, Mu	Communications for Control of Power Systems	Zhe Chen, AAU	2008-
Nicola Barberis Negra	Offshore Wind Power – Grid Connection and Reliability	Birgitte Bak-Jensen (IET - AAU) Ole Holmstrøm (Dong Energy) Poul Sørensen Risø -DTU	2005-2008
Jacob Borbye	Analysis and design of wing tips	Jens Nørkær Sørensen, DTU-MEK Morten Brøns, DTU-MAT	2008-2011
Jacob Pagh Schultz	Manufacturing Imperfections in FRP structures and their influence on Buckling behaviour	Jørgen Juncker Jensen , DTU Christian Berggreen ,DTU Kim Branner , Risø Brian Hayman , DNV-Oslo DTU/MEK	2005-2008 Stops in 2006
Anders Libak Hansen	Hierarchical FEM of Wind Turbine Blades	Erik Lund, AAU Bent F. Sørensen, Risø-DTU Kim Branner, Risø-DTU	2006-2009

*) Internationalization grant from FUR, see below

Internationalization grant from FUR (Case no. 645-03-0109)

One grant is funded:

Project Title	Optimization of electrical system for offshore wind farms via a genetic algorithm					
PhD student	Menghua Zhao				Age	34
E-mail	mez@iet.aau.dk					
Project period	Start	Jan, 2004	Finalized	Dec, 2006		
Supervisors	Zhe Chen, Frede Blaabjerg, AAU					
Description	The new trend of wind power development is offshore wind farms. However, offshore wind farm costs more money than onshore wind farm in both installation and maintenance. Due to the fast development of power electronics, more kinds of configurations for offshore wind farm are possible, which lead to different wind farm design schemes. These design schemes lead to very different costs, system reliability, power quality, and power losses etc. Lots of studies related to wind farm planning, and wind turbine system optimization have been proposed in the literature. The key objective of these researches has been to find the low cost and high reliability design of a wind farm. Whereas the solution is either focused on the wind turbine system or is chosen from several given candidates. The goal of this project is to establish an optimization platform for the electrical system of offshore wind farms. The optimization is approached by Genetic Algorithm (GA). This platform is based on a knowledge database, and composed of several functional modules such as Cost Calculation Module, Reliability Calculation module, Losses Calculation Modules, Load Flow Module etc. In addition, an interface will be present for user to input corresponding parameters. Then, this optimization platform will be applied to a real offshore wind farm. In addition, the optimization platform will be evaluated by changing some conditions of the wind farm.						

Annex A: PhD students

Finalized PhD studies:

Name	Title	Supervisors and institution	Study period
Clemens Jauch	Stability and Control of Wind Farms in Power Systems	Birgitte Bak-Jensen, AAU Poul E. Sørensen, Risø	2003-2006
Jean-Francois Corbett	Modelling of Wind Flow Over Complex Terrain	Lars Landberg, Risø Aksel Wallø Hansen, NBI, KU	2002-2006
Find Mølholt Jensen	Ultimate Strength of a Large Blade Design	Henrik Stang, DTU Jakob Wedel-Heinen, DNV Kim Branner, Risø-DTU	2003-2009
Merete Bruun Christiansen	Satellite Sensing of Off-shore Wind	Inge Sandholt, KU Henning Skriver, DTU Charlotte Bay Hasager, Risø	2003-2006
Andreas Hansen	Flow over Complex Terrain	Niels N. Sørensen, Risø-DTU Jens N. Sørensen, DTU	2003-2007
Menghau Zhao	Optimisation of the Electrical System for Off-shore Wind Farms by A Genetic Algorithm Approach	Zhe Chen, AAU Frede Blaabjerg, AAU	2003-2006
Jacob Berg Jørgensen	Particle Tracking studies of Turbulence and wing motion	Peter Ditlevsen, KU Jakob Mann, Risø	2003-2006
Lennart Kühlmeier	Hybrid CFRP/GFRP Main Spars for Wind Turbine Rotor Blades: Analysis, Design and Experimental Validation	Ole Thybo Thomsen, AAU Erik Lund, AAU Kaj Morbach Halling, VESTAS	2002-2006
Lars Terndrup Overgaard	Structural Instability Phenomena in Wind Turbine Blades	Erik Lund, AAU Ole Thybo Thomsen, AAU	2004-2007
Daniel K. Jensen	Multidisciplinary Analysis and Optimization of Composite structures Taking Manufacturing into Account	Niels Olhoff, AAU Ole Thybo Thomsen, AAU	2003-2006
Morten Liingaard	Bucket foundation of offshore wind turbines	Lars Bo Ibsen, AAU	2003-2006
Kim André Larsen	Bucket foundation of offshore wind turbines	Lars Bo Ibsen, AAU Aalborg University	2003-2006
Nicolai Heilskov	Aeroacoustic Noise Modelling of Noise Emission from Wind Turbines	Jens Nørkær Sørensen, DTU Wen Zhong Shen, DTU Finn Jacobsen, DTU	2003- Stops in 2006
Frederik Zahle	Investigation of Rotor/tower interaction using CFD modelling	Jeppe Johansen, Risø-DTU Mike Graham, Imperial College	2003-2007
Flemming Buus	Segmented Motor Drives	Frede Blaabjerg, AAU Peter Omand Rasmussen, AAU Vestas Wind Systems, Grundfos	2002-2006
Brian Riget Broe	Aerodynamic Noise from Wind Turbines	Jens Nørkær Sørensen, DTU Jakob Mann, Risø-DTU	2004-2009
Bjarne S. Kallesøe	Aeroservoelasticity of Wind Turbines	Jon Juel Thomsen, DTU Morten Hartvig Hansen, Risø	2004-2007
Torsten Lund	Large scale integration of wind energy on a Nordic Grid	Poul Sørensen, Risø-DTU Arne Heide Nielsen, DTU	2004-2007
Jesper Nissen	Modelling wind in the coastal region	Aksel Walløe Hansen, KU Lise Lotte Sørensen, Risø-DTU	2004-2007
Gabriele Gail	Investigation of grid connections to offshore wind parks	Thomas Hartkopf, TU Darmstadt Anca D. Hansen, Risø	2003-2006
Adrian Vasile Timbus	Reliable grid connection detection	Poul Sørensen, Risø-DTU Frede Blaabjerg, AAU	2004-2007
Jenny Trumars	Wave loads on offshore wind	Lars Bergdahl, Chalmers	2003-2006

	turbines	Niels Jacob Tarp-Johansen, Risø	
Niels Troldborg	Numerical Simulation of Wakes of Wind Turbines in Wind Farms	Jens Nørkær Sørensen, DTU Robert Mikkelsen, DTU Wen Zhong Shen, DTU	2005-2009
Clara Velte	Simulation and control of wind turbine flows using vortex generation	Martin O.L.Hansen, DTU Knud E. Meyer, DTU Jens Nørkær Sørensen, DTU	2005-2009
Wei Jun Zhu	Aero-acoustic computations of wind turbines	Wen Zhong Shen, DTU Jens Nørkær Sørensen, DTU	2004-2007
Ignacio Marcos Sanchez	Sprinkler irrigation in Spain. The role of wind	University of Zaragoza, Sp Charlotte Hasager, VEA, Risø University of Zaragoza, Sp	2005-2006
Oliver Gehrke	Self-organising distributed control of a distributed energy system with a high penetration of renewable energy	Niels Kjølstad Poulsen, IMM/DTU Henrik Bindner, Risø-DTU Henrik Madsen, IMM/DTU Arne Heide Nielsen, Eltek/DTU	2005-2009
Philippe Venne	Agent-based control of isolated power system	Henrik Lund, AaU Henrik Bindner, VEA, Risø-DTU	2005-2007
Antonio Vigueras-Rodriques	Power fluctuations from large offshore Wind farms	Poul Sørensen, VEA, Risø-DTU Antonio Viedma, Uni. Politec. de Cartagena, Sp.	2006-2009
Pierre-Eloan Rethore	CFD modellering af store vind parker	Niels N. Sørensen, AAU & VEA, Risø	2006-2009
Jacob Pagh Schultz	Manufacturing Imperfections in FRP structures and their influence on Buckling behaviour	Jørgen Juncker Jensen , DTU Christian Berggreen ,DTU Kim Branner , Risø Brian Hayman , DNV-Oslo DTU/MEK	2005- Stops in 2006
Peter Bjørn Andersen	Wind turbines with trailing edge flaps for load aleviation	Niels Kjølstadt Poulsen, IMM, DTU Thomas Buhl, VEA, Risø- DTU Christian Bak, VEA, Risø-DTU	2006-2009
Ferhat Bingöl	Wind profiles and forest	Jens Nørkær Sørensen, MEK, DTU Jakob Mann, VEA, Risø-DTU	2006-2009
Alfredo Pena Diaz	Winds at high heights and remotes sensing	Geograhical Institute, KU Charlotte Hasager, VEA,Risø-DTU	2006-2009
Mantas Marciukaitis	Short term Prediction in Lithuania	Lithuanian Energy Institute, Kaunas University. Gregor Giebel, VEA, Risø-DTU	2006-2009
Anders Libak Hansen	Hierarchical FEM of Wind Turbine Blades	Erik Lund, AAU Bent F. Sørensen, AFM-Risø-DTU Kim Branner, Risø-DTU	2006-2009
Akarin Suwannarat	'Integration and Control of Wind Farms in the Danish Electricity System'	Birgitte Bak-Jensen, AAU Zhe Chen, AAU	2005-2008
Johnny Jakobsen	Structural Grading – A Novel Concept for Design of Sandwich Sub-Structures	E. Bozhevolnaya, AAU	2005-2008
Leon S. Johansen	Analysis and optimization of composite structures using adaptive analysis methods.	Erik Lund, AAU	2005-2008
Martin Johannes	Failure and Fatigue Phenomena Associated with Local Effects in Advanced Sandwich Structures	Ole Thybo Thomsen, AAU, Elena Bozhevolnaya, AAU	2005-2008
Morten Boje Blarke	Project and system: An interactive plan for large-scale heat pumps in future energy systems	Henrik Lund, AAU Jens Pedersen, Energinet.DK	2005-2008
Brian Vad Mathiesen	Efficient conversion of renewable energy using electrolyses and fuel cells	Henrik Lund, AAU	2005-2008

Marie Münster	Energy System Analysis of Waste Utilization for Energy Production	Henrik Lund, AAU Poul Erik Morthorst, Risø/DTU	2006-2009
Geroges Salgi	Energy System Analysis of Renewable Energy in the Transport Sector – with Particular Focus on Residual Resources	Poul Østergaard, AAU	2006-2009
Nicola Barberis Negra	Offshore Wind Power – Grid Connection and Reliability	Birgitte Bak-Jensen (IET - AAU) Ole Holmstrøm (Dong Energy) Poul Sørensen Risø-DTU	2005-2008
Kristian Holm-Jørgensen	Non-linear Multibody Dynamics of Wind Turbines	Søren R.K. Nielsen, AAU	2005-2009
Christian Le Blanc Bakmar	Wind Turbine Foundations	Lars Bo Ibsen, AAU	2005-2008
Kasper Zinck Østergaard	Robust Control of Wind Turbines	Jakob Stoustrup, AAU and Per Brath, Vestas	2004-2007
Tao Sun	Power quality of grid connected wind turbines with DFIG and their interaction with the grid	Zhe Chen, AAU Frede Blaabjerg, AAU Aalborg University	2004-2006
Oliver Gehrke	Self-organising distributed control of a distributed energy system with a high penetration of renewable energy	Niels Kjølstad Poulsen, IMM/DTU Henrik Bindner, Risø-DTU Henrik Madsen, IMM/DTU Arne Heide Nielsen, Eltek/DTU Risø	2005-2009

Ongoing PhD studies:

Gabriel G. M. Hernández	3D modeling of laminar-turbulent transition on wind turbine blades	Jens Nørkær Sørensen, DTU Wen Zhong Shen, DTU Martin O.L. Hansen, DTU	2005-
Alvaro Semedo	Meso-scale modeling of the Marine Boundary Layers	Ann-Sofi Smedmann, Uppsala U. Søren E. Larsen,VEA, Risø -DTU	2006-
Rozenn Wagner	Remote sensing of power performance	Mike Courtney VEA, Risø DTU, Jens Nørkær Sørensen, MEK, DTU	2006-
Lars Christian Henriksen	Non-linear predictive and control algorithms applied to wind turbines	Niels Kjølstad Poulsen, DTU IMM Morten Hartvig Hansen, VEA Risø DTU	2007-
Claire Vincent	Predictability of wind fluctuations at large offshore wind farms.	Gregor Giebel Risø VEA Risø - DTU, Andre Hahmann VEA Risø DTU Pierre Pinson DTU IMM	2007-
Peter Fisker Skjoldan	AeroAeroservoelastic stability analysis and design of wind turbines	Morten Hartvig Hansen VEA Risø DTU	2007 -
Mads Døssing	Optimisation of rotors-using aerodynamic and aeroelastic models and numerical optimisation	Christian Bak, Helge aagaard, Mac Gaunaa VEA Risø DTU	2008-
Christian Beller	Urban Wind Energy	Christian Bak , Helge Aagaard Madsen VEA-Risø- DTU	2008-
Fridrik Rafn Isleifson	Online stability assessment in networks with high penetration of decentralised production	Henrik Bindner VEARisø DTU Arne Hejde Nielsen, DTU CET	2008-
Luca Vita	Offshore Vertical Axis Wind Turbines with Floating and rotating Foundation.	Troels Friis Petersen, VEA Risø DTU	2008-
Andreas Fischer	Noise generation and transmission from wind turbines	Helge Aagaard Madsen VEA Risø DTU	2008-
Daniel Kullmann	Policy-based communication for control of distributed power	Henrik Bindner VEA Risø DTU	2008-

	systems.		
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